

Network-Centric Acquisition

The Key to Joint Warfighting

DR. R.A. LEFANDE

Joint warfighting is obstructed by the finely divided acquisition process. The field commands are unified, the Joint Forces Command is simulating the effectiveness of Joint Warfare, and the Secretary of Defense's massive staff holds all the pieces in place. Yet the individual Services retain the "Organize, Train, and Equip" mandate bestowed by the United States Code, and they maintain hundreds of isolated programs to acquire materiel components that must function in unison when the Joint Force goes into action. The proprietary sociology of these disparate programs contributes to perceived duplication and waste that erodes public confidence and often causes poor interoperability. And interoperability, DoD now recognizes, is essential to Joint Warfighting.

Application of Network technology to materiel acquisition could achieve true "Jointness"—just as it is expected to magnify Joint warfighting effectiveness. A Network-Centric Acquisition process would ensure interoperability, eliminate rapid platform obsolescence, shorten response times when new threats emerge, and reduce unnecessary costs—if only the sociological minefield can be cleared.

The Traditional Acquisition Process Has Its Roots in the Civil War Problems with "shoddy" materiel and corrupt suppliers during the Civil War led to the creation of what became the MILSPEC [Military Standards and Specifications] system of product definition and the career Civil Servant whose job



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*LeFande is Associate Director of Research,
Systems Directorate, Naval Research Laboratory,
Washington, D.C.*

security provided some protections against the temptations to accept unsuitable materiel in exchange for personal gain. Thus evolved the famous 100-foot shelf of detailed “how to” specifications and the much-maligned “Bureau-crazy,” which allowed the government to procure materiel in a price competition while ensuring that the cheapest item was still good enough for the job.

Detailed specifications also ensured that parts made by any number of suppliers could be used interchangeably, and that the logistics chain was burdened only by the essential number of unique items. This raised the “entry cost” for new suppliers who just wanted to sell their existing products or for those suppliers lacking the necessary “process controls,” but it also provided a measurable description of what the government wanted and a reliable basis on which to develop a “bid” price. In essence, the “military” specifications were little different from those used by the phone company, aircraft manufacturers, and others who needed to buy parts from many suppliers with the confidence that they would mate-up with the other parts and work as intended—and they were *Joint*.

Today's Management Fads

Disregard the Lessons of the Past

Every line in the thousands of MILSPEC pages was based on some—perhaps long forgotten—adverse experience or careful research that did not have to be repeated as long as the specification was followed and/or the external conditions remained unchanged. The knowledgeable Program Manager was expected to “tailor” the procurement by selecting only the paragraphs or operating conditions that were the least demanding (expensive) but would still work under warfighting conditions.

Currently, fashionable “reinvented” acquisition models discard these “hard learnt” lessons in favor of “performance” specifications at the platform level that trust the contractor to make the detailed engineering choices. Natural Selection of the high-technology marketplace is

assumed to have made the shrinking pool of suppliers better equipped to make the engineering trade-offs than the forgotten authors of the moldy old specifications.

This “reinvented” model ignores the realities that most of the military-industrial giants are almost wholly dependent on the government for support; that there is little commonality between commercial and military items more complex than toilet paper; and that bigger issues such as commonality, interoperability, survivability, and life cycle support may be more crucial to Joint Warfare than are first-cost or paperwork reduction.

Buy as Industry Buys, Not Just From Industry

The successful manufacturer of complex systems maintains effective “System Engineering” controls over its product lines, which ensure that the system will perform as expected if each component performs within its specified tolerances. They use the “System Engineering” process to maximize efficiency by sharing components among various models, and negotiating with component suppliers to adjust “requirements” when a more cost-effective product would result, thereby ensuring that failure (or cost growth) at a single component supplier doesn’t jeopardize the product line. This has been done manually with drawings, printed specifications, test fixtures, and other technologies of the day for hundreds of years because it was necessary to ensure that the commercial or military system performance was “under control.”

It continues today with Computer Aided Design (CAD), Networked Data Sharing, Computer/Numerically Controlled (CNC) machines, and widely accepted standards for materials and components—not only to control the system-level outcomes but also to maximize efficiency. New automobiles or commercial aircraft are designed and tested as far as possible in the digital realm before any metal is bent; a single database is shared by the designers of each “piece-part”; each component design is “nego-

tiated” with the potential suppliers to avoid unnecessary special “tooling” or exotic materials; and the Deming-esque/“Six-Sigma” controls are built in.

Software—the biggest challenge to current defense acquisitions and the biggest “show-stopper” in joint operations—is an integral part of this “Network-Centric” development process. A single, carefully controlled repository for the software design is owned by the manufacturer, is accessed by all contributors, and is used in real or virtual testing. “New” features are added only when a proven “algorithm” cannot be “reused”; “code” (machine-readable instruction) is generated automatically to suit the latest processor hardware.

This is how modern industries build their products, and it is the way the government should be building *its* products—not merely buying disjointed platforms or sub-systems from industry. The Joint Warfighting Entity should be *The System*, with the design data and software *Owned by the Government* to be reused, shared, and improved by all concerned—*Jointly*.

Components of Modern Warfighting Sub-Systems Evolve at Different Rates

The wonderful digital electronics components that produced the “New Economy” and made Network-Centric Acquisition common practice outside of the Defense establishment, become obsolete in the time it takes to complete a single deployment. The hardware and manufacturing methods for Hull, Machinery and Electrical (HM&E) sub-systems of ships change at a relatively glacial rate and—in this country at least—are practiced only on behalf of the government. Some software algorithms—the mathematical prescription, not the “code”—haven’t changed in centuries, but they are “developed” anew for each platform or sub-system simply because of the disjointed acquisition process.

Current contractor-centric/platform-level acquisition philosophy is ill suited to accommodate these disparate evolutionary time-scales, and blending the

lost arts of the industrial age with the lightning obsolescence of information dominance is an invitation to failure. A computer chip selected when the keel is laid will be quaint by the time the ship is christened; and the algorithm to counter the newly observed war-reserve mode of an anti-ship missile may have to be broadcast while the missile is in flight.

Choices made in a competitive platform-level/performance-based procurement are bound to bring a sub-optimum blend of technologies and manufacturing know-how despite the elaborate “teaming” arrangements that often appeal more to congressional interests than to the need for warfighting agility. “Network-Centric” Acquisition allows the “Long-Lead” ship (i.e., the HM&E)—now a small fraction of the life cycle cost—to be built with little more than a “space, weight, and power” provision for the payload. Electronics hardware can be assembled out of modular building blocks made by automated processes wherever possible, tested at land-based test facilities, and loaded onto the ship along with the other “stores” just before the deployment. Software “code” can be “broadcast” to the ships and other users at any time, having been assembled out of certified modules and tested with mathematical rigor for reliability and interoperability right up until its insertion.

Accommodation to incompatible evolutionary time scales at the component or sub-system level is the essence of the agile Network-Centric model and anathema to the Platform- or Contractor-Centric model.

Time and Industrial Base Reconstitution are Still Factors in Preparedness

Information dominance expected in Network-Centric Warfare may multiply the effect of the few thousand missiles, shells, and bombs that we will take to the initial engagement by factors of 10 or 100 (although this has not been proven in recent experience), but complete preparedness must consider replenishment and even Industrial Base reconstitution.

In the great wars of the past, we could convert our industrial capacity to “ramp up” production while our allies paid dearly for the lead-time. Today, we no longer build commercial ships or consumer electronics, and many electronic components are made overseas with the inherent risk of transportation disruption or even hidden information bombs.

The government preserved the warfighting manufacturing know-how of the past in MILSPECs, arsenals, shipyards, and even in warehoused tooling for munitions and other specialized items. Commercial plants converted to war materiel often kept little more than the buildings, skilled workers, and general-purpose tools. The plants are now fewer and are optimized for “lean”/“Just-In-Time” manufacturing with little surplus capacity, but they also have flexible CAD/CNC capabilities that could be switched to intermittent or continuous military production via Network-Centric Acquisition—if things are planned that way.

Acquisition planning must include provisions for expandable production if we wish to have palatable options when our political objectives cannot be obtained with the stockpiled materiel. This may require design compromises and/or government investments in manufacturing capacity to ensure that the flow of munitions and replacement platforms could be maintained in any plausible scenario. This will be more expensive than “buying-out” the production run of a platform or weapon with maximum peacetime efficiency, and it will require use of the Joint Network-Centric Acquisition methodology to maximize commonality and to avoid dependence on components or materials that may be denied in wartime.

Digital/Network Technology Can Preserve Past Lessons with Modern Efficiency

Manual methods of the past appear awkward to the dashing innovators of today who confuse the rapid evolution of feature-laden consumer electronics with military information systems. Rapid obsolescence, unknown provenance, lim-

ited interoperability, and short time between stoppages make these suitable only for the least critical “support” functions such as briefing preparation. And their connection to any warfighting network is reckless at best.

These tools—or their more sophisticated industrial cousins—can be applied with discipline and care to modernize the paper specifications and hardware tooling of the Industrial Age with digital drawings, machining instructions, and “drill-down” traceability to the knowledge base of analysis and historical experience that underpins every choice. Network-Centric Acquisition uses digital tools to organize, access, share, preserve, extend, and apply this hard-won knowledge base rather than discard it because it seems clumsy to those impatient to leap ahead in technology or to streamline the process.

Today’s version of the streamlined acquisition exposes the Defense effort to the risks of re-learning many past lessons and introduces perverse incentives that cause program managers to pass the “risk” to the supplier, even though the government will pay in the end. Reduction of risk at the program level is instilled in each program manager, even at the expense of the joint enterprise. Opportunities to optimize the wider/long-term goals of commonality, interoperability, and evolutionary upgrades, on a variety of time-scales, are missed at every level—from a single program office to the entire Department of Defense.

In its full maturity, Network-Centric Acquisition will have a single, Joint database containing the digital prescription to make every piece of hardware and software that will be procured, supported, and employed by the Joint Force. “New” ships, tanks, or aircraft will evolve from existing designs by changing only the components that must change to achieve the new level of cost effectiveness in the face of old or new threats. Any component could be replaced if a new supplier wishes to enter the competition or if the availability of some material or piece-part is

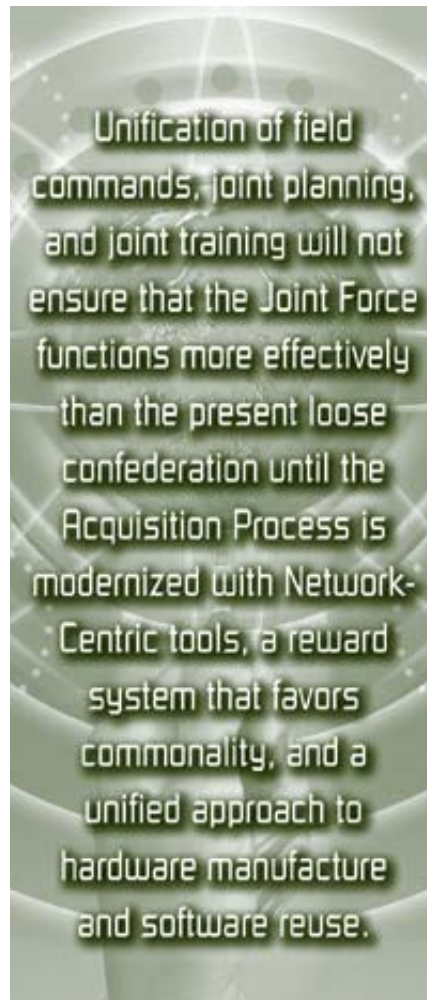
threatened by supplier failure or enemy action. Preference will be given to components that can be made automatically by as many manufacturers as possible; and final assembly or maintenance will be performed by interchangeable contractors, perhaps at Government-Owned Facilities.

Software is the Major Factor In Today's Cost and Risk, and is Most Amenable to Network-Centric Methods

While the vision of Network-Centric Acquisition is little beyond a mirror of enlightened Commercial "Best-Practices," the conversion from today's Contractor-Centric model will be resisted by entrenched interests and current Platform-Centric sociology. Unavoidably, it must be introduced while the current process continues to function as best it can.

The most appropriate place to start is with software that has no production phase or inertial manufacturing plant—in other words, software that is all "development." This "development" may continue forever through so-called "maintenance" (correction of development errors) and upgrades (provision of new or previously overlooked "requirements"), and is hugely redundant as very few "functions" are unique to a given platform or application. Software is also the primary cause of the failed interoperability that obstructs the effective functioning of the Joint Force, and is frequently the cause of ineffective weapons or destroyed platforms. Even within a single Program Office or platform, redundant software development is tolerated at the sub-system level lest the contractors' creativity be stifled or the risk be transferred to the government.

The progressive/Network-Centric approach to software acquisition minimizes both cost and risk at the individual program level while ensuring that each sub-system supports the Joint warfighting need for interoperability, security, and configuration control. As long as individual programs within the Services are allowed to optimize their in-



dividual outcomes on the time-scale of individual tours, the waste and redundancy will continue; and the Force-Multiplication expected of Joint Warfare will be divided by the inability to share information.

The Journey to Process Improvement Starts With Government-Owned Design and Government-Furnished Software

Whether hardware or software, the key to Network-Centric Acquisition is government "ownership" of the designs for which it has paid. The digital equivalent of drawings, specifications, "source code," and other elements that would allow a third party to produce identical copies must be a "deliverable" in each procurement action. The Design is the Product in the case of the software, and the quality of the documentation produced by the platform or sub-system supplier should be tested by having the actual software instructions prepared by

a separate entity—using only the delivered documentation—and passed back to the supplier for testing and use. If the instructions do what the documentation calls for, but the end item fails to work as required, the supplier would be expected to investigate the cause of failure and correct the documentation, which would then be used to reform the "code" until it is correct.

If this appears to be too tedious or expensive, it must be compared to the current methods of uncovering errors by crashing aircraft or dropping bombs on friendly forces. Once the process is underway, modern software description tools would be used to filter-out all but the most subtle design flaws, and a library of Government-Owned/Furnished software building blocks would be available for preferred reuse. The improved software acquisition process would lead to enterprise-wide cost avoidance and reduced risk of mission failure; and would increase the probability that the interoperability and information sharing that are fundamental in the operation of a Joint Force will be achieved.

Both the Congress and the Shore Establishment Must Cede Their Territorial Imperatives

Preparation for Joint Warfighting is impeded by difficulties inherent in equipping a Joint Force by the separated Services. Divisions continue like fractals to the finest levels of former Secretary of Defense Robert S. McNamara's program elements and the shore establishment's program sponsors. Each identified program "belongs" to some warfare specialty where its existence and partitioned identity is treated as the equivalent of a "Command at Sea" to be protected until it can be handed over to one's relief.

It is unimaginable or impolitic to peek over the partition to see if one's "requirement" might be met by adding a function or stanza of software to another's program or to depend on another to perform their task effectively—just as one would in Joint Warfare. These divisions are exacerbated by the Congress' insistence on the auditable separateness

of the Program Elements and contract awards that can be traced to their districts and trumpeted as effective representation.

A more streamlined acquisition program structure and a reduced staff requiring programs to sponsor would act as a direct counter to this centrifugal sociology; but a more enlightened, Network-Centric approach, perhaps with a different reward system, could lead to the desired results. The Shore Establishment analyst could be encouraged to introduce "new" capabilities by studying the existing inventory of hardware-software building blocks through the use of the modern information sharing tools of this digital age. Those pursuing new capabilities could be rewarded more highly for, say, finding ways to add a

new piece of information to an existing data link rather than marketing a whole new set of communications gear that would be dedicated to their peculiar function.

Congress could reinforce this behavior by encouraging consolidation of Program Elements and monitoring the performance of their districts through cumulative results based on their [constituents'] ability to contribute quality components or sub-systems by following the Network-Centric way.

Network-Centric Acquisition, Beginning with "Software," Is the Key to Joint Warfighting Unification of field commands, joint planning, and joint training will not ensure that the Joint Force functions more

effectively than the present loose confederation until the Acquisition Process is modernized with Network-Centric tools, a reward system that favors commonality, and a unified approach to hardware manufacture and software reuse. The lessons in Industrial Best-Practices provide a model for decentralized yet unified Defense Acquisition if the inertia of the staffs and vendors can be overcome.

The easiest and the most necessary area to get underway—before any force multiplication expected of Joint Warfighting could be realized—is with software that must operate as a single system.

Editor's Note: LeFande welcomes questions or comments on this article. Contact him at pnpgpr@erols.com.

Report of the Military Research Fellows DAU 2000-2001

FROM CHAOS TO CLARITY:

How Current Cost-Based Strategies are Undermining the Department of Defense

Authors

Lt. Col. Warren Anderson, USAF

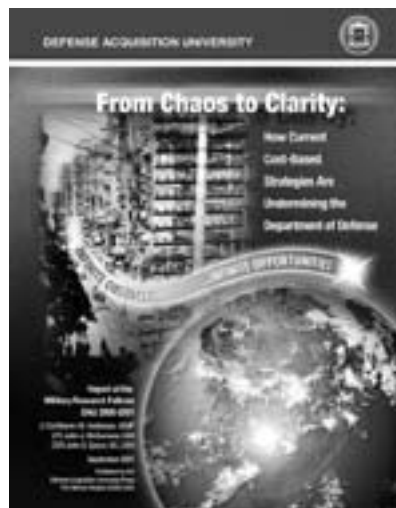
Lt. Col. John McGuiness, USA

Cmdr. John Spicer, SC, USN

The latest Defense Acquisition University Military Research Fellows Report, *From Chaos to Clarity: How Current Cost-Based Strategies are Undermining the Department of Defense*, is now available in hard copy as well as online. Dated September 2001, the report details how DoD's cost-based initiatives fail to align with the Department's business strategy.

Historically, DoD has followed a generic strategy of differentiation, not cost leadership. The Department's beliefs, values, and mission are aligned to support this generic strategy. Office of Management and Budget (OMB) Circular A-76 and related initiatives, with their focus on cost, are not well suited for an organization such as DoD, which competes on quality, not cost. This misalignment of strategy and outsourcing policy has generated a great deal of concern within DoD, especially among base and installation commanders who must implement A-76 and related measures.

The authors make the case that A-76 results, as measured by savings goals, have not generated anywhere near the results ex-



pected. Indeed, cost-driven outsourcing strategies, according to their report, are undermining DoD. The effort put into OMB Circular A-76 and related initiatives is great, yet the savings are at best marginal. Evidence is now emerging that these initiatives are degrading mission performance.

The intended audience is the DoD acquisition, technology and logistics workforce as well as policy makers.

The report may be downloaded from the DAU Web site at <http://www.dau.mil/pubs/mfrpts/mrflist.asp>. Non-government personnel may purchase hard copies of DAU publications for a nominal charge by calling the Government Printing Office at (202) 512-1800; to fax a request, call (202) 512-

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